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United States Coast Guard

Commandant
United States Coast Guard

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COMDTINST 3500.3

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COMMANDANT INSTRUCTION 3500.3

Subj: OPERATIONAL RISK MANAGEMENT

Ref: (a) Team Coordination Training, COMDTINST 1541.1

1. PURPOSE. This Instruction standardizes the Coast Guard's Operational Risk Management (ORM) policy and outlines procedures and responsibilities to implement it.

2. ACTION. Area and district commanders, commanders of maintenance and logistics commands, commanding officers of headquarters units, assistant commandants for directorates. Chief Counsel, and special staff offices at Headquarters shall ensure this Instruction is distributed to the widest extent possible and all personnel comply with its provisions.

3. DIRECTIVES AFFECTED. None.

4. BACKGROUND. Human error causes a significant number of mishaps that have resulted in the loss of personnel, cutters, boats, aircraft, and equipment. Many times faulty risk decisions have placed our personnel at greater risk than necessary. After four major marine mishaps between 1991 and 1993, including the capsizing and sinking of the F/V SEA KING, the National Transportation Safety Board issued two recommendations documenting the need for Coast Guard risk assessment training. Reference (a) formalizes the Team Coordination Training (TCT) program to combat human error by focusing on improved team performance to prevent mishaps. This curriculum and other similar programs, such as Crew Resource Management (CRM), contain risk management principles that outline a systematic process to continuously assess and manage risks: the ORM process.

   a. Risk Management Workshop. In the Fall of 1996, the Coast Guard held a multi-dimensional workshop whose participants included afloat, aviation, marine safety, Auxiliary, Research and Development, Quality and Performance Consulting, and training

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	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
A	2	2	2		2	2	1	2	1	1		1	2	2	1	1	1	1	1		2					
B	40	8	11	2	6	1	1	1	1	1	1	4	1	12	2	1	1	2	1	1	2	1	1	1	1	1
C	4	4	1	2	2	1	1		2	1	2	2	2	4		1	1	1	2	1	1	1	1	1	1	2
D	4	2	1	4	1	1		4	1				2						1	1	1	1	1	1		1
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commands representing the aids to navigation, search and rescue, maritime law enforcement, and small boat communities. Despite differences in individual missions and approaches toward risk management, each community shared the basic philosophy of minimizing risks without sacrificing mission success. They also shared the same concern for developing a common risk management process the Coast Guard could apply universally to improve communication among various operational communities during joint efforts for more effective decision-making. After sharing individual ideas, all programs reached consensus on a simple, common, effective process. These results formed the framework for this standard ORM process.

b. TCT and CRM Programs. The TCT and CRM programs already provide the delivery vehicles to adequately train active duty, reserve, and Auxiliary operational personnel in risk management principles and processes. Initiatives are under way to train MLC personnel as TCT facilitators to lead other Coast Guard personnel, including civilians, through the concepts of risk management, during normal safety and compliance visits. A TCT correspondence course, especially helpful to those not required to attend formal TCT or CRM programs, also is available to anyone desiring to learn risk management principles. Having advocated these basic principles for many years, the TCT and CRM programs have taken a "bottom to top" approach toward developing a formal universal risk management plan. Measuring mishap rates involving boats' and cutters' mobility and navigation shows these principles are effective and the tools used are valid. Since the earliest implementation of TCT in 1992, boats' and cutters' mishap rates per 100,000 operating hours have declined steadily:

Decrease in Mishap Rates per 100,000 Operating Hours (Compared to 1987-1992 Average Baseline Rates)		
Fiscal Year	**Boats**	**Cutters**
1994	40%	78%
1996	66%	89%
1998	71%	75%

This Instruction expands a flourishing acceptance of these principles at the operational unit level to all organizational levels in the Coast Guard, and clearly reinforces the Commandant's direction for improved decision-making for superior performance.

c. Other Service Programs. While compatible with other armed forces' efforts, the Coast Guard's standard risk management plan is specifically tailored for our organization's unique size and multi-mission nature.

5. SCOPE. The application of ORM basic concepts is not limited to unit or mission operations as the Coast Guard usually defines them. All Coast Guard missions and daily activities, both

on- and off-duty, require decisions managing risk. In ORM "operational" refers not solely to a rated person or operator, but includes any military or civilian Team Coast Guard member who contributes to the overall goal of increasing unit effectiveness. All organizational levels contribute either directly or indirectly to operational mission successes. From an Integrated Support Command or Naval Engineering Support Unit technician swapping out a 41-foot utility boat's engine, to an electronics technician maintaining a group high-site antenna, to an acquisition officer purchasing new equipment or services, to a marine safety officer selecting and deploying pollution response resources, to an area staff planning a major operation or exercise, to a motor lifeboat coxswain working a challenging SAR case, every command level and every person is responsible for identifying potential risks and adjusting or compensating accordingly. Therefore, ORM's target audience includes all those involved in operations, maintenance, and support activities. While risk assessment and risk management concepts generally apply to all Coast Guard activities and decision-making, some areas require additional tools and techniques. Regulatory and/or rule-making requirements need a more quantitative, in-depth analysis than the techniques presented here. The Coast Guard Marine Safety and Environmental Protection Program has made significant progress in that regard through the development of specific Risk-based Decision-Making Guidelines. However, this Instruction's procedures do apply to the marine safety and environmental protection community in managing Coast Guard members' safety and related issues and thus supplement rather than supplant the Marine Safety decision-making guidelines.

6. PHILOSOPHY. Traditional risk management practices assert risk is "bad." In reality that may not be so. Taking *calculated* risks is essential for an organization to grow and capitalize on its capabilities. The Coast Guard's aim is to increase mission success while reducing the risk to personnel, resources, and the environment to a level acceptable to a particular unit for a given situation. Units should identify risk using the same disciplined, organized, logical thought processes that govern all other aspects of military endeavors. ORM provides the framework to minimize risk, show concern for colleagues, and maximize the unit's mission capabilities, helping to achieve the Commandant's direction, "Perform all operations flawlessly." This process's additional benefits include safeguarding our members' health and welfare and conserving vital resources and support equipment. As the Coast Guard continues to operate in a streamlined environment, preventing mishaps and reducing losses become even more important to maintain mission readiness. To accomplish these goals, the Coast Guard must change its business focus from a compliance-based to a risk-based philosophy. No longer can the Coast Guard afford to simply audit its units to ensure compliance with various requirements and regulations. ORM focuses on units' missions, the risks involved, and the safeguards in place to ensure mission success. Beyond reducing losses, risk management provides a logical process to identify and exploit opportunities producing the greatest return on our investment of time, dollars, and personnel.

7. RISK TERMINOLOGY. Team members need to understand ORM terms clearly and communicate risk effectively in order to use the ORM process. Understandably, each facility and activity will differ in how it interprets risk assessment and risk management results in its own community due to unique mission differences and its members' varying degrees of

knowledge, skill, experience, and maturity. All personnel shall use these common key terms when communicating risk across program and activity lines.

a. Operational Risk Management (ORM): A continuous, systematic process of identifying and controlling risks in all activities according to a set of pre-conceived parameters by applying appropriate management policies and procedures. This process includes detecting hazards, assessing risks, and implementing and monitoring risk controls to support effective, risk-based decision-making.

b. Risk: The chance of personal injury or property damage or loss, determined by combining the results of individual evaluations of specific elements that contribute to the majority of risk concerns. Risk generally is a function of severity and probability. The models in this Instruction, however, single out exposure as a third risk factor.

c. Severity: An event's potential consequences in terms of degree of damage, injury, or impact on a mission.

d. Probability: The likelihood an individual event will occur.

e. Exposure: The amount of time, number of cycles, number of people involved, and/or amount of equipment involved in a given event, expressed in time, proximity, volume, or repetition.

f. Mishap: An unplanned single or series of events causing death, injury, occupational illness, or damage to or loss of equipment or property.

g. Hazard: Any real or potential condition that can endanger a mission; cause personal injury, illness, or death; or damage equipment or property.

h. Risk Assessment: The systematic process of evaluating various risk levels for specific hazards identified with a particular task or operation. Various models are available to complete this step in the ORM process.

i. Risk Rating Scale: A scale of specific risk degrees, determined during the ORM process's risk assessment step. Various Coast Guard communities and activities should use the safety industry's standard terms low, medium, and high when discussing risk across program lines. However, each community will define low, medium, and high risk in terms meaningful to its own personnel.

8. CONCEPT. The ORM process:

   a. Is a decision making tool people at all levels use to increase operational effectiveness by anticipating hazards and reducing the potential for loss, thereby increasing the probability of a successful mission.

   b. Advocates harnessing feedback and input from all organizational levels to make the most informed decisions possible.

   c. Exists on three levels: time-critical, deliberate and strategic. Risk decisions must be made at levels of responsibility that correspond to the degree of risk, considering the mission significance and the timeliness of the required decision. Enclosure (1) discusses these three levels of risk management application in more detail.

9. PRINCIPLES. Apply these basic decision-making principles before executing any anticipated job, action or mission. As an operation progresses and evolves, personnel should continuously employ risk management principles during the decision-making process.

   a. Accept No Unnecessary Risk: All Coast Guard operations and daily routines entail risk. *Unnecessary* risk conveys no commensurate benefit to safety of a mission. The most logical courses of action for accomplishing a mission are those meeting all mission requirements while exposing personnel and resources to the lowest possible risk. ORM provides tools to determine which risk or what degree of risk is unnecessary.

   b. Accept Necessary Risk When Benefits Outweigh Costs: Compare all identified benefits to all identified costs. The process of weighing risks against opportunities and benefits helps to maximize unit capability. Even high-risk endeavors may be undertaken when decision-makers clearly acknowledge the sum of the benefits exceeds the sum of the costs. Balancing costs and benefits may be a subjective process open to interpretation. Ultimately, the appropriate decision authority may have to determine the balance.

   c. Make Risk Decisions at the Appropriate Level: Depending on the situation, anyone can make a risk decision. However, the appropriate level to make those decisions is that which most effectively allocates the resources to reduce the risk, eliminate the hazard, and implement controls. Commanders at all levels must ensure subordinates are aware of their own limitations and when subordinates must refer a decision to a higher level.

   d. ORM is Just as Critical in Executing as in Planning All Activities: While ORM is critically important in an operation's planning stages, risk can change dramatically during an actual mission. Therefore, supervisors and senior leadership should remain flexible and integrate ORM in executing tasks as much as in planning for them.

10. PROCESS. Figure 1 illustrates the Coast Guard's seven-step ORM process. Enclosure (1) thoroughly describes each process step, provides some useful models for risk assessment, and

outlines the elements of launching and recovering small boats as an example of a deliberate application of the ORM process.

SEVEN-STEP ORM PROCESS

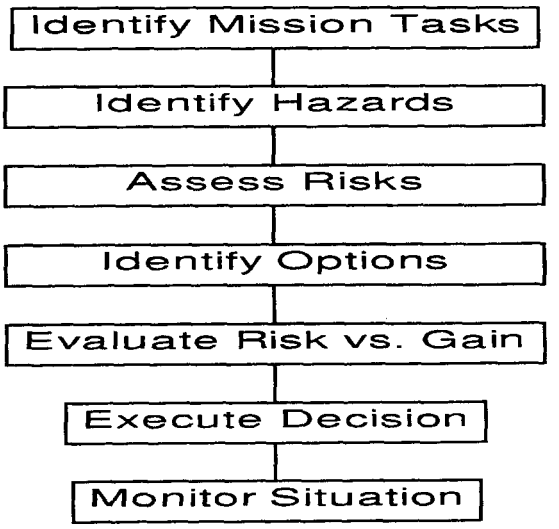

Figure 1

11. REQUIRED ORM COMPETENCIES: Table 1 suggests the expected ORM proficiency for the active duty, reserve, Auxiliary and civilian forces at the entry, intermediate, and senior work levels. Specific circumstances may warrant flexibility in determining specific ranks for certain categories corresponding to a person's position and expected extent of responsibility in an organization. TCT and CRM are current delivery programs already in place to train intermediate and senior supervisory personnel to achieve these competencies. A member's first exposure to ORM fundamentals should occur in a formal training setting when practical. Therefore, entry-level training curricula should incorporate the basic elements of communications and describe the ORM process to achieve an overall awareness.

ORM COMPETENCIES		
Job Level	**Rank**	**Proficiency Criteria**
Entry	Recruits Officer Candidates Cadets Direct Commission Officers Civilian Employees (through GS-7)	1. Describe the ORM process steps. 2. Learn standard ORM terms and be able to explain basic actions required for each step. 3. Bring information under their control to the decision-maker. 4. Expected responsibility in monitoring situations and executing risk decisions.
Intermediate	Petty Officers Junior Officers Civilian Employees (GS-8 through GS-12)	1. Apply ORM techniques in mission-oriented environments. 2. Demonstrate team coordination behaviors that promote risk management. 3. Demonstrate risk management in planning and executing tasks.
Senior	Chief Petty Officers Chief Warrant Officers Senior Officers Civilian Employees (GS-13 and up)	1. Advocate and support risk management. 2. Apply ORM concepts in initially developing and reviewing plans, directives, and other written guidance.

Table 1

12. IMPLEMENTATION. A key objective is to implement the ORM process as an integrated aspect of daily activities and operations. Successfully implementing ORM will create an environment in which every Coast Guard member is motivated to personally manage risk in all they do. Due to resource limitations, smaller units are not expected to use these implementation methods as frequently or thoroughly as larger units having more resources.

How do I implement ORM? Implementation efforts should correspond to the complexity of the processes and procedures of the various activities targeted. In other words, devise simple implementation plans for simple processes. Integration plans should target processes, procedures, and guidance affecting daily activities, such as checklists, drill sheets, operations manuals, standard operating procedures (SOP), training doctrines, pre- and post-deployment briefings, stress-related issues, orientation and indoctrination programs for new personnel, plans for dockside availabilities or yard periods, construction plans, refueling and/or maintenance procedures, hazardous materials procedures, recreational activities, fiscal management, acquisition, and accountability procedures, among others. A person or team in a command's existing leadership structure, or those specially designated to monitor ORM integration initiatives, will select and prioritize those processes. Each individual command ORM integration plan should include responsibilities, milestones, and performance measures

for specific actions. Commanders, commanding officers or officers-in-charge, and upper management should monitor the progress of implementation efforts.

The Atlantic Area Training Team is a good, real-world example of integrating risk management concepts into daily processes. The Training Team has effectively embedded TCT and risk management elements into its cutter Special Emergency Operations Procedures (SEOPS) evaluation program through drill sheets, training doctrine, and briefings.

13. MANAGEMENT ROLES AND RESPONSIBILITIES.

a. **Commanders, commanding officers, and officers-in-charge shall:**

(1) Manage risk effectively.

(2) Select from risk reduction options developed.

(3) Accept or reject risk based on the benefit derived.

(4) Motivate leaders to use ORM and advocate supporting training opportunities.

b. **Staff elements, department heads, and division officers shall:**

(1) Assess risks, develop risk reduction options, and implement additional safeguards as needed.

(2) Eliminate ineffective safeguards.

(3) Ensure those writing doctrine or planning orders apply ORM concepts.

(4) Eliminate barriers to taking acceptable risks.

c. **Supervisors shall:**

(1) Apply the ORM process to operations and tasks and encourage its use off duty.

(2) Elevate risk issues to higher authority for resolution when appropriate.

d. **Individuals shall:**

(1) Understand, accept, and implement risk management processes.

(2) Maintain situational awareness of the changing risks associated with an operation or task and assertively notify supervisors when appropriate.

14. PROGRAM RESPONSIBILITIES.

a. **Commandant:**

(1) Assistant commandants for directorates and special staff offices at Headquarters shall:

(a) Integrate the ORM process and concepts into appropriate doctrinal publications and manuals for all Coast Guard missions and activities;

(b) Incorporate ORM principles into appropriate personal qualification standards publications; and

(c) Require program managers to review programs periodically to help field units identify areas and processes for ORM implementation.

(2) Commandant (G-WT) shall:

(a) Validate including basic ORM principles and terms into initial (entry-level) or qualification indoctrination and training programs (including basic military training for recruits, officer candidates, and Academy cadets; direct commission programs; professional military education; and applicable class "A" schools) through the Training Coordination Council;

(b) Incorporate ORM concepts into military requirements for advancement; and

(c) Integrate ORM concepts into professional development and leadership courses at the Leadership Development Center.

(3) After validation by the Training Coordination Council, applicable training program managers shall integrate ORM concepts into pertinent curricula at Training Center, Petaluma; Reserve Training Center, Yorktown; Aviation Training Center, Mobile; and Aviation Technical Training Center, Elizabeth City.

(4) Commandant (G-WK) shall:

(a) Serve as technical advisor on ORM issues; and

(b) When practical, incorporate ORM lessons learned into regular safety messages promulgated to the field.

(5) Commandant (G-OCX) shall develop detailed implementation guidance for the Auxiliary.

b. **Area and district commanders shall:**

(1) Ensure SOPs and/or OPLANs apply the ORM process and ORM concepts in coordinating missions, in the course of normal reviews;

(2) Integrate ORM process and supporting concepts into Afloat Training Group tactical cutter training and readiness evaluations, and ensuring that training requirements specified in reference (a) are included in readiness evaluation checklists;

(3) Ensure all exercises and planning efforts address the ORM process; and

(4) Incorporate ORM into unit readiness evaluations, e.g., SEOPS and Ready-for-Sea programs.

c. **Section, activity, group, and unit commanders and marine safety offices shall:**

(1) Incorporate ORM concepts into daily operational, maintenance, and support activities, using appropriate guidance provided by applicable program managers, e.g., daily preventive maintenance and operating checklists for small boats and shipboard systems; pre-underway and entering port checklists; port security waterfront and passenger terminal monitoring activities to deter potential terrorist attacks; boat and aircraft search and rescue and law enforcement patrol planning and execution; pre- and post-flight engineering maintenance and aircrew system checks; facilities engineering departments performing scheduled maintenance or conducting minor repairs, e.g., to a damaged boiler; integrated support commands' welding and carpentry or hazardous materials handling; civil engineering units evaluating the environmental impacts of a proposed new park or base golf course; and facility design and construction centers designing new roads or buildings;

(2) Include ORM process information in all operational briefs, e.g., pre- and post-flight mission briefs; cutter port briefs; and damage control, navigation, and seamanship training team exercises and briefs;

(3) Include ORM process information in appropriate written, operational notices and plans during the course of normal updates, e.g., cutter organization manuals, Commanding Officer's Standing Orders, AMIO, helicopter operations, law enforcement, and other operational bills; pulsed counter-narcotics and fisheries enforcement operation planning and execution; and maritime defense zone exercises; and

(4) Integrate ORM process concepts into group inspections and Ready-for-Operations procedures.

d. **Maintenance and logistics commands shall:**

(1) Incorporate ORM concepts into the unit safety and environmental health program; and

(2) Instruct units in ORM concepts during normal safety and compliance visits.

T. W. JOSIAH
CHIEF OF STAFF

Encl: (1) Operational Risk Management Process Steps

OPERATIONAL RISK MANAGEMENT

I. Operational Risk Management Process (ORM) Steps

Figure 1 illustrates the Coast Guard's "seven-step" ORM process.

Figure 1

II. Using the ORM Process

Figure 2 expands and assigns more specific actions to each ORM process step.
Subsequent pages briefly describe each step and provide useful models to help assess risk.

COMMUNICATIONS & SITUATIONAL AWARENESS

1. Define Mission and/or Task	• What does the task entail? • What do we have to do? • Are there other ways to do this?
2. Identify Hazards **P***lanning* **E***vent* Complexity **A***sset* Selection **C***ommunications* (and Supervision) **E***nvironmental* Conditions	• What can go wrong? → Equipment → Personnel → Environment • How is risk defined for us? • What safeguards exist? How effective are they?
3. Assess Risks *Low* *Medium* *High*	• What are the effects? – Severity • Can this happen to us? – Probability • What is the event frequency or degree of involvement? – Exposure
4. Identify Options **S***pread out* **T***ransfer* **A***void* **A***ccept* **R***educe*	• Are risks acceptable or unacceptable? → What options can eliminate *unacceptable* risk (that which does not contribute to accomplishing the mission safely)? → What options reduce undesirable risk? • Can we modify mission to reduce risk? • Are any safeguards missing? • What new options should we consider?
5. Evaluate Risk vs. Gain Double-check the mission or task Verify the objective is still valid	• Did someone with authority validate the potential risks resulting from the options considered are worth the gain? • This risk decision must be made at the lowest appropriate level, considering experience and maturity.
6. Execute decision	• Implement the best options. • Have we allocated the necessary resources? • Have we initiated risk management procedures? • Does everyone know why we are doing this and the expected outcome?
7. Monitor situation	• Are the safeguards working? • Are participants accomplishing the mission or task objective? • Has the situation changed?

Team coordination skills vital to the process

Figure 2

Step 1:

Define the Mission or Task: To accomplish this step review current and planned operations, describing the mission at hand. The commander defines what is required to accomplish the tasks and the conditions under which to conduct them. To assist with this step, construct a list or chart depicting the operation's major phases or steps in the job process, normally in time sequence. Break down the operation into "bite-size" chunks.

Step 2:

Identify Hazards: Using the list or chart formulated in Step 1, list the hazards associated with each phase of the operation or step in the job process. Potential failures, i.e., things that could go wrong, encompass equipment or operational problems both internal and external to the unit. Looking at each element of the "PEACE" model (Planning, Event complexity, Asset selection, Communications, and Environmental conditions) will ensure effective hazard identification in each of these three main categories:

- **Equipment:** Is the equipment functioning properly and will it do so throughout the planned evolution?
- **Environment:** How will weather, geographic influences, physical barriers, workplace climate, and available light effect the event?
- **Personnel:** Are personnel properly trained and capable of handling the mission's demands? Are they fatigued, complacent, or suffering from physical or mental stress?

The key to successfully analyzing risk is to carefully define the hazards and identify and evaluate safeguards. In brainstorming sessions, asking the question "What if?" is an excellent tool to help identify all potential hazards. Specific hazard identification is important, since it leads to assessing risk more accurately and subsequently developing risk control options or safeguards more thoroughly. When identifying a hazard, state what it is, and further, describe the cause of potential exposure to that hazard, since that will help identify risk controls or safeguards later in the process.

Step 3:

Assess the Risks: Consider risk applicable to the unit and the mission. Determine individual risk levels for each hazard identified. Assess risk by evaluating specific elements or factors, that, when combined, define risk. Two models that assess risk for these hazards are the Severity, Probability, and Exposure (SPE) and the Green, Amber, and Red (GAR) models. They differ in how they look at the hazards identified in Step 2 of the ORM process.

SPE RISK ASSESSMENT MODEL

The SPE model assesses risks for specific hazards, such as those involved in launching or recovering a small boat or aircraft, by determining risk as a function of severity, probability, and exposure; i.e., Risk = f(S,P,E). This model uses this formula:

Risk = Severity x Probability x Exposure

Severity: Severity is an event's potential consequences measured in terms of degree of damage, injury, or impact on a mission. Should something go wrong, the results are likely to occur in one of these areas:

- Injury or Death
- Equipment Damage
- Mission Degradation
- Reduced Morale
- Adverse Publicity
- Administrative and/or Disciplinary Actions.

Severity can vary from 1 to 5:

1 = None or slight
2 = Minimal
3 = Significant
4 = Major
5 = Catastrophic

Probability: Probability is the likelihood that the potential consequences will occur.

Probability can vary from 1 to 5:

1 = Impossible or remote under any conditions
2 = Unlikely under normal conditions
3 = About 50-50
4 = Greater than 50%
5 = Very likely to happen

Exposure: Exposure is the amount of time, number of occurrences, number of people, and/or amount of equipment involved in an event, expressed in time, proximity, volume, or repetition.

Exposure can vary from 1 to 4:

1 = None or below average
2 = Average
3 = Above average
4 = Great

By computing the level of risk, we can evaluate its potential impact on mission effectiveness and execution. After computing the risk values using the formula **Risk = S x P x E,** we need to control substantial to very high values:

Values	Degree of Risk	Guidance
80-100	Very High	Discontinue, Stop
60-79	High	Correct Immediately
40-59	Substantial	Correction Required
20-39	Possible	Attention Needed
1-19	Slight	Possibly Acceptable

After computing the risk levels for each hazard identified, we can order hazards from the highest to the lowest risk to focus first on the areas of most concern in conditions of limited resources.

GAR RISK ASSESSMENT MODEL

We can address more general risk concerns, involving planning operations or reassessing risks as we reach milestones within our plans, by using the GAR model. A survey of cutter commanding officers identified these elements as contributing to the majority of risk in their cutter operations: supervision, planning, crew selection, crew fitness, environment, and event or evolution complexity. The GAR model incorporates these elements, further defined below:

Supervision: Supervisory control should consider how qualified a supervisor is and whether he or she actually is supervising. Even if a person is qualified to perform a task, supervision, even as simple as verifying the correctness of a task, further minimizes risk. The higher the risk, the more a supervisor needs to focus on observing and checking. A supervisor actively involved in a task (doing something) can be distracted easily and probably is not an effective safety observer in moderate to high-risk conditions.

Planning: Preparation and planning should consider how much information is available, how clear it is, and how much time is available to plan the evolution or evaluate the situation.

Crew and Watchstander Selection: Crew and watchstander selection should consider the experience of the persons performing the specific event or evolution. If individuals are replaced during the event or evolution, assess the new team members' experience.

Crew and Watchstander Fitness: Crew and watchstander fitness should judge the team members' physical and mental state, generally a function of how much rest they have had. Quality of rest should consider how a platform rides and its habitability, potential sleep length, and any interruptions. Fatigue normally becomes a factor after 18 hours without rest; however, lack of quality sleep builds a deficit that worsens the effects of fatigue.

Environment: Environment should consider all factors affecting personnel, unit, or resource performance, including time of day, lighting, atmospheric and oceanic conditions, chemical

hazards, and proximity to other external and geographic hazards and barriers, among other factors.

Event or Evolution Complexity: Event or evolution complexity considers both the time and resources required to conduct an evolution. Generally, the longer the exposure to a hazard, the greater the risks involved. However, each circumstance is unique. For example, more iterations of an evolution can increase the opportunity for a loss to occur, but on the positive side, may improve the proficiency of the team conducting the evolution, depending on the team's experience, thus possibly decreasing the chance of error. Other factors to consider in this element include how long the environmental conditions will remain stable and the precision and level of coordination needed to conduct the evolution.

Calculating Risk: To compute the total degree of risk for each hazard previously identified, assign a risk code of 0 for no risk through 10 for maximum risk to each of the six elements to obtain a personal estimate of the risk. Add the risk scores to come up with a total risk score for each hazard. Figure 3 is suitable for this process:

Risk Calculation Worksheet	**Risk Score**
Supervision	
Planning	
Crew Selection	
Crew Fitness	
Environment	
Event/Evolution Complexity	
TOTAL SCORE	

Figure 3

GAR Evaluation Scale for Color-Coding the Degree of Risk		
0 23	24 44	45 60
10 20	30 40	50
GREEN (Low risk)	**AMBER** (Caution)	**RED** (High risk)

If the total risk value falls in the green zone (1-23), the risk is rated low. A value in the amber zone (24-44) indicates moderate risk; consider adopting procedures to minimize it. If the total value falls in the red zone (45-60), implement measures to reduce the risk before starting the event or evolution.

The GAR model is good to assess an operation or mission generally. If the degree of risk appears unduly high in one or more of the elements above, perform a second assessment using the SPE model for each element of concern, since the SPE model is more specific. As with the SPE model, rank-order all hazards assessed in the GAR model from the highest to the lowest risk to target areas of greatest concern first.

Risk Ratings: The ability to assign numerical values or color codes to risk elements in either the SPE or GAR model is not the most important part of risk assessment. What is critical in this ORM step is team discussion to understand the risks and how the team will manage them. Different Coast Guard operational communities have adopted the GAR model, but may interpret green, amber, and red differently for their own missions and operators. For example, law enforcement personnel may define a "green" risk level a bit higher than personnel involved in recreational boating safety. Understanding these differences will improve communications among communities. However, a low/medium/high scale is generally understood throughout the Coast Guard and is the safety industry's widely used standard. Therefore, discussions of risk among various Coast Guard activities will use the terms low, medium, and high, but each operational community will define those terms meaningfully for its own operators.

Step 4:

Identify the Options: Starting with the highest risk hazards assessed in Step 3, identify as many risk control options or safeguards as possible for all hazards exceeding an acceptable degree of risk. Determine each option's impact on mission and unit goals and select the

perceived best alternative or combination of alternatives. Mission priority and time criticality often drive option choice. Risk control options include: **Spread out, Transfer, Avoid, Accept, and Reduce (STAAR).**

Spread Out: Risk commonly is spread out by increasing either the exposure distance or the time between exposures.

Transfer: Transferring risk does not change probability or severity but rather shifts possible losses or costs to another entity.

Avoid: Avoiding risk altogether requires canceling or delaying the job, mission, or operation, but this option is rarely exercised due to mission importance. However, it may be possible to avoid specific risks, e.g., avoid risks associated with a night operation by planning the operation for daytime.

Accept: Accept risk when the benefits clearly outweigh the costs, but only as much as necessary to accomplish the mission or task.

Reduce: Risk can be reduced. The overall goal of risk management is to plan missions or design systems that do not contain hazards. However, the nature of most complex operations and systems makes it impossible or impractical to design them completely hazard-free. As we analyze hazards, we will identify those requiring resolution. To be effective, risk management strategies must address risk's components: severity, probability, and exposure.

- Using protective devices, engineering controls, and personal protective equipment usually helps control *severity*.

- Training, situational awareness, attitude change, rest, and stress reduction usually help control *probability*.

- Reducing the number of people involved or the number of events, cycles, or evolutions usually helps control *exposure*.

Step 5:

Evaluate Risk vs. Gain: Analyze the operation's degree of risk with the proposed controls in place. Determine whether the operation's benefits now exceed the degree of risk the operation presents. Be sure to consider the cumulative risk of all identified hazards and the decision's long-term consequences. This step also serves as a reality check to verify the objective still is valid.

- If the risk's costs outweigh the benefits, re-examine the control options to learn whether any new or modified controls are available. If not, inform the next level in the chain of command the mission's risk, based on the evaluation, exceeds the benefits and should be modified.

- If the mission's benefits outweigh the risks, with controls in place determine if the current level in the chain of command can implement all the controls. If not, find assistance from the next level in the chain of command.

- When notified of a situation whose risk outweighs benefit, the next level in the chain of command should assist with implementing required controls, modify or cancel the mission, or accept the identified risks.

The equation **Risk = Severity x Probability x Exposure** defines what is called the expected value of the loss. However, individuals can value the same loss differently because the loss may affect their overall satisfaction (their needs, issues, and concerns) differently. It is easy to overlook the issue of perceived value in typical risk management theories, but it may determine the kinds of actions decision-makers take in weighing risk vs. gain. Personnel should be aware the acceptability of risk can vary from person to person because the perceived risk, affected by different values placed on the expected loss, also varies. Therefore, while taking this "reality check" step in the risk management process, it is wise to consider a loss's perceived as well as expected value to avoid potential controversy when making risk decisions.

Step 6:

Execute the Decision: Once the risk control decision is made, assets must be made available to implement the specific controls. Part of implementing control measures is informing the personnel in the system of the risk management process results and subsequent decisions. If personnel disagree, the decision-makers should explain the decision rationally. Carefully documenting the decision and all steps in the process, usually done only for deliberate or strategic ORM applications, facilitates communications and clarifies the rational process behind risk management decisions.

Step 7:

Monitor the Situation: Monitor the situation to ensure the controls are effective and remain in place. Identify changes requiring further risk management and act on them. Take action when necessary to correct ineffective risk controls and reinitiate the risk management steps in response to new hazards. It is important to remember **RISK MANAGEMENT IS A CONTINUOUS PROCESS.** Failure to respond to changes in the situation can become a link in a chain of errors that lead to a mishap.

III. Levels of Risk Management

The risk management process exists on three levels. While it may be desirable to apply risk management in depth to every mission or task, time and resources may not always be available. One objective of risk management training is to develop sufficient proficiency in applying the process so risk management becomes an automatic part of the decision-making methodology on and off duty. Leaders must employ the risk management process to make sound, timely decisions. The three levels of risk management are:

- Time-Critical: Time-critical risk management is an "on the run" mental or verbal review of the situation using the basic risk management process without recording the information. Personnel employ the time-critical process to consider risk when making decisions in a time-compressed situation. This level of risk management is used during both the execution phase of training or operations and in planning and executing crisis responses. It also is the most easily applied level of risk management in off-duty situations. It is particularly helpful in choosing the appropriate course of action when an unplanned event occurs while executing a planned operation or daily routine.

- Deliberate: Deliberate risk management applies the complete process. Each step is documented in some manner, at the discretion and for the benefit of the process owner. It primarily uses experience and brainstorming to identify hazards and develop controls and therefore is most effective when done in a group. Examples of deliberate applications include planning upcoming operations; reviewing standard operating, maintenance, or training procedures; and planning damage control or disaster response.

- Strategic: The Strategic process identifies hazards and assesses risk more thoroughly than the Deliberative process by researching available data, using diagramming and analysis tools, testing formally, and tracking hazards associated with the system or operation over the long term. An independent contractor equipped with the necessary tools and expertise to perform an ORM strategic application is likely to be needed to perform this task. Strategic applications study complex operations' or systems' hazards and associated risks, or those whose hazards are not well understood. Examples of strategic applications may include long-term, complex operational planning and introductions of new equipment, materials, missions, and major replacement assets.

IV. **Example of Applying a Deliberate Level of ORM**

To prepare for transferring personnel or equipment, a Deck Watch Officer (DWO) might use ORM to plan to launch and recover small boats.

Step 1:

Define the Mission or Task: The operational commander has identified these requirements:

- The transfer must occur within the next four hours; its maximum duration is 30 minutes
- The event involves transferring 200 pounds of boxed electronic testing gear and one Electronics Technician to another medium endurance cutter at sea
- The small boat is the best option due to the proximity to the receiving cutter, the number of personnel, and amount of equipment involved

These are the primary tasks (not an all-inclusive list) for launching and recovering a small boat:

a. Muster and brief appropriate deck personnel

b. Personnel staff their stations and prepare to lower and recover the small boat
c. Deck Watch Officer (DWO) ensures appropriate launch and recovery equipment are energized
d. Conning Officer steers a proper launch and recovery course
e. For launching:
   - Bring small boat to the rail or lower boat alongside, as appropriate, to load personnel and equipment
   - Boat is away; retrieve sea painter and stow lines
f. For recovery:
   - Pass sea painter to small boat as it approaches alongside
   - Secure small boat alongside, or engage forward then aft falls, and bring to the rail to unload personnel or equipment, as appropriate
   - Cradle small boat and secure for sea
g. Launch and recovery equipment are de-energized
h. Deck debrief; ship returns to base course

Step 2:

Identify Hazards: Many different hazards could be associated with each operational phase identified in Step 1. Here are a few, possible causes for exposure, and simple safeguards to limit exposure to those hazards.

Hazard	Cause	Safeguard in Place
Personnel slip, fall, are pinched or trapped	Wet deck, gear adrift, fatigue, boat overload, high sea state, inadequate training, complacency, inadequate supervision	Non-skid boat deck
Lose control of boat in water or on deck with potential for death, serious injury, equipment damage, mission failure	Material casualty, e.g., davit, line, or cable failure; hydraulic leak; high sea state; improper procedures (winch davit operation or coxswain); improper positioning (boat or boat-lowering detail)	Crew weight-tests cables annually and replaces them as needed
Fire or explosion	Material casualty, hydraulics, boat overload, improperly stowing flammables; improper electrical load	Electrical cut-off switch

Step 3:

Assess the Risks: Using the SPE model and the rating and descriptions for each risk factor as explained, determine the risk level for each hazard above and rank-order from highest to lowest risk.

- **Personnel slip, fall, are pinched or trapped:** Severity = 4, Probability = 2, Exposure = 3; Risk = S x P x E = **24** (possible risk; attention needed)

- **Lose control of boat:** Severity = 4, Probability = 2, Exposure = 2; Risk = **16** (slight risk; possibly acceptable)

- **Fires or explosion:** Severity = 5, Probability = 1, Exposure = 2; Risk = **10** (slight risk; possibly acceptable)

Step 4:

Identify the Options: Identify and evaluate risk control options according to their impact on mission and unit goals, using each STAAR technique element for guidance. Some of the risk control options available for the "Personnel slip, fall, are pinched or trapped" hazard are:

- Avoid some risk by delaying transferring the personnel or equipment until conditions are optimal (favorable sea state, daytime vice nighttime, etc.), if possible.
- Reduce the risk by ensuring adequate supervision is available or increasing supervision in suspect areas.
- Reduce risk by ensuring the personnel involved are not overly fatigued from previous or multiple evolutions.
- Reduce risk by using personal protective equipment and engineering controls effectively to reduce the severity of possible mishaps.
- Reduce risk by thoroughly inspecting the deck and small boat space to ensure proper housekeeping and eliminate tripping hazards.
- Hold a dry run if necessary to ensure all personnel, especially those recently qualified, thoroughly understand their duties and positions.

Step 5:

Evaluate Risk vs. Gain: With all the controls in place, the DWO determined the cumulative risk of all the hazards was acceptable. The gain in this case far outweighed the risk, especially since the unit needing the electronics equipment and technical support would lose mission readiness and effectiveness and possibly could have to pull into port for repairs if immediate support were not available. Therefore, a reality check verified the task's objective was still valid.

Step 6:

Execute the Decision: Based on the DWO's ORM analysis, the commanding officer decides to launch the small boat to conduct the transfer before nightfall, clarifies supervisory roles, and communicates all potential risk factors to personnel involved in the evolution during the pre-launch brief.

Step 7:

Monitor the Situation: The DWO closely monitors the weather and sea state for any significant changes that could affect the small boat launch and especially considers the material readiness of the small boat-lowering equipment. The Executive Officer monitors the boatswains mates' walk-through boat deck inspections for thoroughness to ensure tripping hazards are eliminated. The crew immediately reports any significant changes in these factors so the CO can reassess the decision to launch. A post-event debriefing identifies which controls were effective and the command takes measures to implement them in future evolutions.